

- II. "On Beds of Sponge-remains in the Lower and Upper Greensand of the South of England." By GEORGE JENNINGS HINDE, Ph.D., F.G.S. Communicated by HENRY WOODWARD, LL.D., F.R.S. Received April 29, 1885. Read May 21.

(Abstract.)

I have pointed out in this paper the occurrence in the Lower and Upper Greensand strata of the Wealden area, the Isle of Wight and the south-western counties, of beds of rock formed to a large extent of the detached spicular remains of siliceous sponges, and thus distinctly of organic origin. Their true characters have not been generally recognised, and they have usually been described as deposits of sandstone, chert, malm, hearthstone, firestone, &c. In the Lower Greensand these beds are mainly developed in the lower, or Hythe, division, and they are exposed at Haslemere, Midhurst, Petworth, Godalming, Tilburstow Hill near Godstone, Sevenoaks, Maidstone, and at Hythe. The sponge-beds vary from three-quarters of an inch to three feet in thickness; between them, as a rule, there are intervening beds of sand or sandstone. The greatest total thickness of the sponge-beds exposed in any one section is 11 feet. Sponge-beds are less common in the higher or Folkestone division of the Lower Greensand, but they are numerous at Folkestone itself, and reach a total thickness of more than 8 feet, and there is also a thin bed in this division at Sevenoaks. The Lower Greensand strata at Faringdon, in Berkshire, are of an altogether different character to those of the same formation in the area treated of in this paper, and the sponges which abound therein are likewise entirely different, being *calci* sponges, and retaining their entire forms.

The sponge-beds in the Upper Greensand are of two distinct types, one of which is shown on the northern and western margin of the Weald, and the other in the Isle of Wight, and further westward in the counties of Wilts, Somerset, Dorset, and Devon. In the first-named district the sponge-beds are of a soft, greyish-white, siliceous, or siliceo-calcareous rock, known under the names of malm, hearth, or firestone. In this the sponge spicules principally occur in the negative form of minute empty casts, the presence of which renders the rock extremely light and porous. The beds can be traced nearly continuously along the northern and western margin of the Wealden area, and they are well shown at Godstone, Merstham, near Reigate, Betchworth, Farnham, and Selborne. Further northwards they are present at Wallingford, in Berkshire. The beds vary in thickness from 15 feet at Merstham to 60 feet at Farnham.

In the more typical Upper Greensand of the Isle of Wight and the

south-western counties, the sponge-beds consist of thick layers of chert and porous siliceous rock at the summit of the series, immediately beneath the so-called chloritic marl; whilst in the lower division the sponge-remains principally occur in loose quartzitic sands with siliceous accretions. The chert or sponge-beds at the top of the Upper Greensand are best exposed at Shanklin, Ventnor, and the Undercliff, in the Isle of Wight, at Warminster in Wiltshire, and Penzlewood in Somersetshire. They vary from 10 to 25 feet in thickness. The sponge-beds of the lower division are scarcely recognisable in the Isle of Wight, but they attain a thickness of 10 to 20 feet on the summit of the Blackdown and Haldon Hills in Devonshire, and at Axmouth in Dorsetshire. The chert here is only present in beds of subordinate importance.

Sponge-beds of similar characters to those of the Greensand have been described from the Hilssandstein in Westphalia, which is of Neocomian age, and, judging from specimens which I have examined, the "Gaize de l'Argonne," which is largely developed in the Ardennes, and the "Meule de Bracquengnies" in Belgium, are sponge-beds, filled with spicules and spicular casts like those of the Greensand.

The sponge-remains in the various beds are exclusively those of siliceous sponges. In some the silica of the spicules yet retains its original colloidal condition, in which it is negative to polarised light and readily soluble in caustic potash. The matrix of the sponge-beds of the malm and firestone is also to a large extent of colloidal or amorphous silica, and this material has been deposited in the form of minute globules or disks, and seems to have been derived from the sponge spicules, with the empty casts of which the beds are throughout filled.

More generally the original amorphous silica of the sponge-remains has been altered to chalcedony, and the chert and porous siliceous rock accompanying it, which is filled with traces of the spicules, are likewise of chalcedony; occasionally the chalcedony gives place to crystalline silica.

Glauconite very commonly fills the canals of the spicules, and remains after the spicular walls have been removed; it also replaces the spicular walls.

In some sponge-beds the spicules have been nearly entirely replaced by crystalline calcite; they are embedded in a matrix of granular limestone.

As a general rule the sponge-spicules are inclosed in a compact matrix in which their forms can only be partially studied, but under certain conditions they are loosely distributed in sand, or in fine powder in cavities in chert, from whence they can be obtained quite free from matrix. The sponge-beds appear to be composed of detached, free, spicules of disintegrated sponges; entire sponges are absent.

These spicules belong to numerous species. All four orders of siliceous sponges are represented, but whilst the Monactinellid and Hexactinellid sponges form but a small proportion, the Tetractinellid and Lithistid sponges, more particularly those of the Megamorina family, are extremely abundant.

III. "The Solar Spectrum from $\lambda 7150$ to $\lambda 10,000$." By Capt. ABNEY, R.E., F.R.S. Received May 6, 1885.

(Abstract.)

The paper deals with the method employed in taking the photographs of the solar spectrum, from which the map accompanying it was made, and indicates the degree of accuracy which has been obtained.

IV. "On Charging Secondary Batteries." By WILLIAM HENRY PREECE, F.R.S. Received May 6, 1885.

1. I have for the past twelve months been experimenting with secondary batteries with a view of getting an efficient, uniform, and constant source of currents for electric lighting my house, and I have succeeded beyond my expectations. Some new facts have developed themselves during my experience, which I have thought of sufficient importance to bring before the Society.

2. The cells are of the Planté type, manufactured by the Elwell Parker Company of Wolverhampton. Fourteen plates of plain sheet lead $17'' \times 11''$ are suspended in well insulated wood boxes filled with diluted sulphuric acid in the proportion of about 1 to 10. These plates are grouped in two groups of seven, each group being soldered to a lead strip, forming alternately the positive and negative poles of the cell. The plates of the respective poles are prevented from touching each other by ebonite grids or separators.* Each plate offers a surface of $1\cdot3$ square feet, so that the total surface of lead of each group opposed to each other is $9\cdot1$ square feet; that is, $9\cdot1$ square feet of peroxidised lead is opposed to $9\cdot1$ square feet of spongy lead. I use twenty-four such cells.

3. My charging current varies from 3 to $3\frac{1}{2}$ ampères per square foot, while the current of discharge used in lighting my house varies from 1 to $1\frac{1}{2}$ ampère per square foot. The total weight of each cell is

* These ebonite grids were introduced by Mr. Charles Moseley, and have effectually removed one incessant source of trouble in these cells, viz., short-circuiting through the buckling of the plates.